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(71) Applicant
Bosch-Siemens Hausgeräte GmbH

(Incorporated in FR Germany)

Hochstrasse 17, 8000 Munchen 80,
Federal Republic of Germany

(72) Inventors
Rudolf Begero
Horst Witt

(74) Agent and/or Address for Service
Dr. Walther Wolff & Co
6 Buckingham Gate, London, SW1E 6JP

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F23D F24C

(54) Gas oven

(57) A gas oven comprises a manually operable gas cock (2) with two outlets (3, 4) for a grill burner (7) and for a baking oven burner (6), an electromagnetic valve (5) being arranged in the feed to the baking oven burner. The cock (2) is provided with an electromagnetic holding device (8), actuating current for which is produced by respective thermal elements (10, 11) associated with the two burners. The cock (2) is coupled by two gear wheels (12, 13) with an electric thermostat (14) which drives a control and monitoring unit (16) for the valve (5) and the holding device (8) on the one hand and a gas ignition device (17) on the other hand. The electromagnetic valve (5) has an emergency actuation shaft (30), which is manually operable in the case of current failure and which actuates a switch (32) for interruption of current supply to the control and monitoring unit (16).

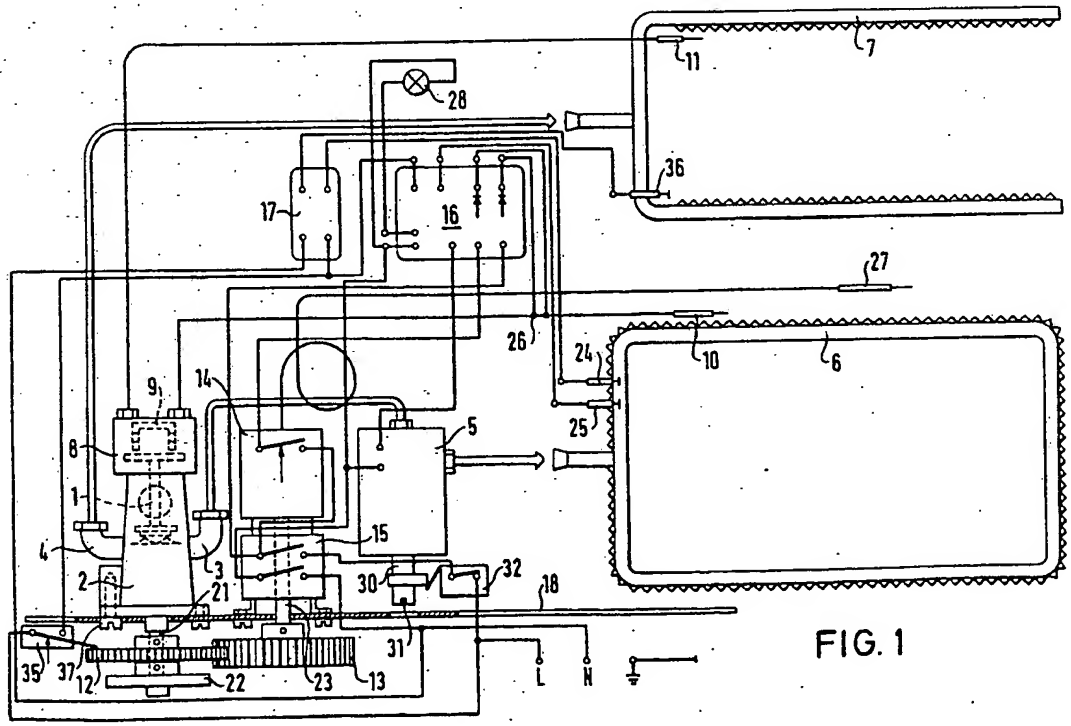

FIG. 1

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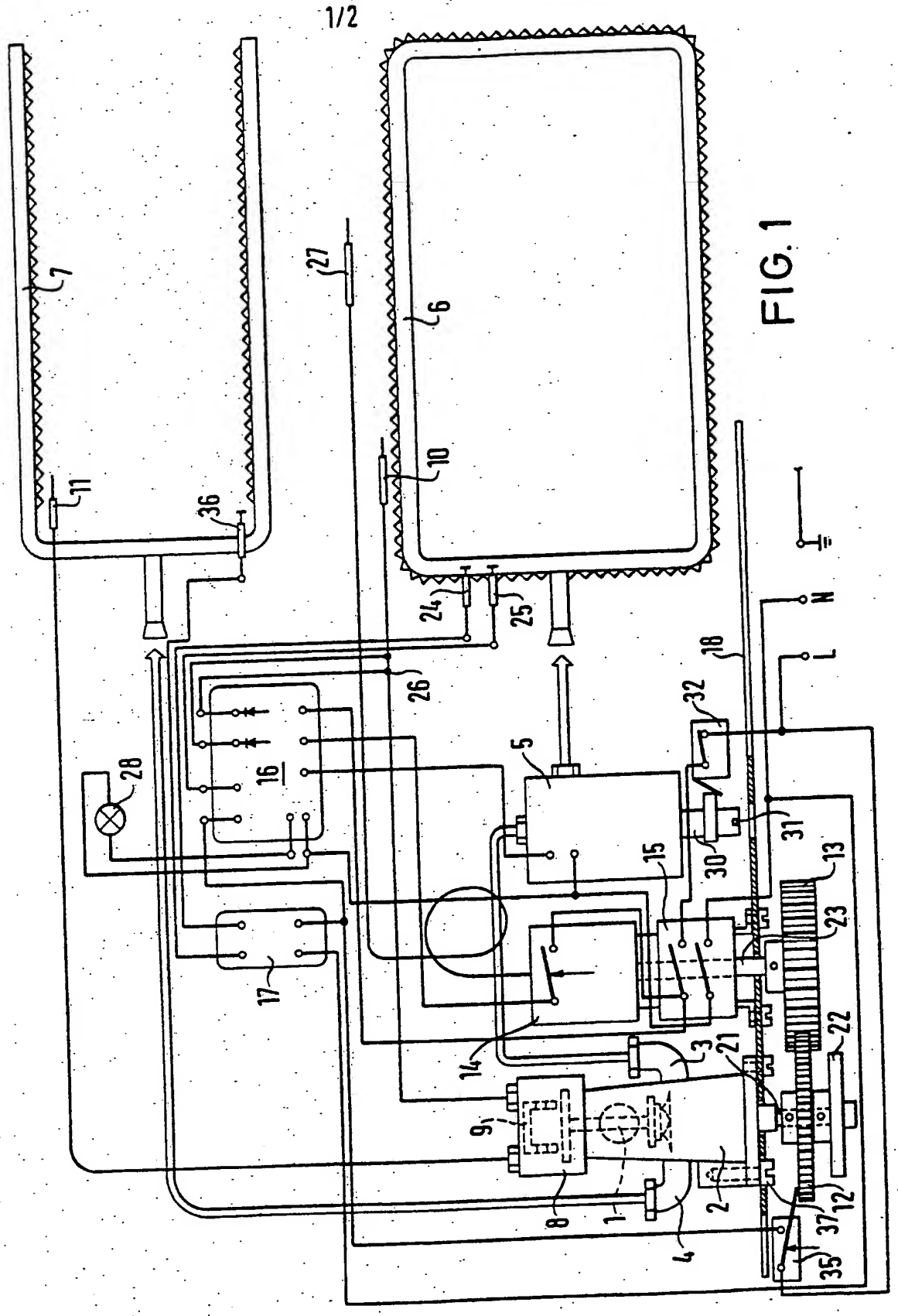
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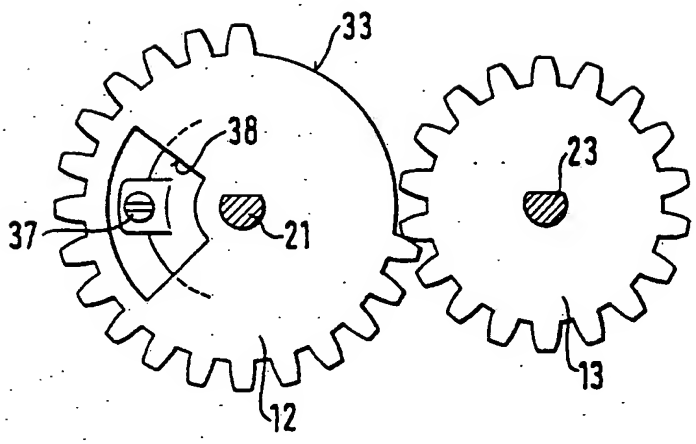
FIG. 1

FIG. 2



GAS OVEN

The present invention relates to a gas oven, and has particular reference to regulating and control equipment in a domestic gas baking oven with a baking oven burner and an additional grill burner.

For the regulation of gas feed and temperature in baking ovens, it is known to use magnetic valves which are opened and closed according to the requirements by means of an electric thermostat connected in front thereof. In that case, baking oven temperatures of between 50 and 270°C can be regulated. Protection and monitoring of the baking oven burner is then usually provided by an ionisation-monitoring system which operates on the basis of the conductivity of the burner flames. If the burner flames are present, then current continues to be fed by means of a control element to the magnetic valves so that they remain open. On extinction of the burner flame, the current feed to the valves is stopped so that they are closed.

Electromagnetic valves controlled in this manner, however, have the disadvantage that the baking oven burner in the event of current failure can no longer be used, since an external current is required.

Although there are electromagnetic valves of a kind which can be opened mechanically from outside in the case of current failure, the baking oven burner is then without protection or monitoring.

There is therefore a need for equipment for monitoring and control of at least one burner so as to control the burner safely in the case of use of electrical current as auxiliary energy. Such equipment should preferably be constructed as simply as possible.

According to the present invention there is provided a gas oven comprising a baking oven burner, a grill burner, a manually operable

gas cock with two outlets each connected by a respective duct to a respective one of the burners, electromagnetic holding means actuable to hold the gas cock in an open state, electromagnetic valve means arranged in the duct to the baking oven burner, ignition means for ignition of gas in the oven, a control and monitoring unit for controlling each of the electromagnetic holding means, the electromagnetic valve means and the ignition means, an electric thermostat mechanically coupled to the gas cock and operable to drive the control and monitoring unit, a respective thermal element associated with each of the burners and arranged to provide actuating current for the electromagnetic holding means, and manually operable means operable to permit supply of gas from the gas cock to the baking oven burner for emergency operation thereof in the case of failure of actuating current supply to the electromagnetic valve means.

In a preferred embodiment the oven comprises a gas cock, which is mechanically drivable and has two outlets, for the grill burner and for an electromagnetic valve connected in front of the baking oven burner. The gas cock is provided with an electromagnetic insert, the holding current of which is produced by a respective thermal element in the baking oven and in the grill burner. The gas cock is mechanically coupled with an electric thermostat, which drives the control and monitoring unit for the electromagnetic valve and the insert on the one hand and the gas ignition means on the other hand. The electromagnetic valve has a manual emergency actuation facility, so that it can be opened mechanically in the event of current failure. A limit switch then serves for interruption of the current feed to the control and monitoring unit.

Thus, a functional unit composed of two differently operating regulating and control devices with independent control systems is provided, so that operation is possible even in the case of current failure.

Expediently, the mechanical coupling between the gas cock and the electric thermostat is effected by way of a gear wheel pair, of which one gear wheel is mounted on a shaft, which is axially displaceable by way of a control grip, of the gas cock and the other gear wheel is mounted on the shaft of the thermostat. The pitch circle diameters of the two gear wheels is preferably selected so that different rotational angle ranges of the gas cock and the thermostat are synchronised.

In order to enable direct driving of the grill burner, the gear wheel of the gas cock shaft may have an untoothed circumferential region over a sector associated with operation of the grill burner gas feed.

For the control and monitoring of the gas feed for the gas oven burner, the electromagnetic valve may be drivable in parallel by a sensor of the thermostat and by a flame ionisation detector.

Furthermore, a thermo-electric safety circuit incorporating the electromagnetic holding means can be arranged to be bridged over by an external current supply, which acts on the thermal element associated with the baking oven burner in such a manner that the magnetic insert of the gas cock is constantly activated.

For emergency actuation of the electromagnetic valve in the case of current failure, this expediently has a manually actuable switch shaft with a limit switch for interruption of current supply to the control and monitoring unit by separation of the unit from an actuating

current supply terminal.

In place of this emergency actuation, a manually openable bypass valve can also be provided in parallel with the electromagnetic valve.

An embodiment of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a schematic circuit diagram of regulating and control equipment in a gas oven embodying the invention; and

Fig. 2 is a view of a gear wheel pair mechanically coupling a gas cock and electric thermostat of the equipment.

Referring now to the drawings, there are shown in Fig. 1 components of a gas oven with a central gas feed 1, which is indicated only schematically, connectible by way of a gas cock 2 with two outlets 3 and 4 thereof, wherein the outlet 3 is connected by a duct to an electromagnetic valve 5 for a baking oven burner 6 and the outlet 4 by another duct to a grill burner 7.

The gas cock 2 at its inward end has a magnetic insert 8 which in operational setting is held by a magnet 9 in the form of a so-called double adaptor, the magnet current of which is produced primarily by a thermal element 10 at the baking oven burner 6 and a thermal element 11 at the grill burner 7.

The gas cock 2 is mechanically coupled by way of a gear wheel pair 12 and 13 with an electric thermostat 14. The thermostat 14 is combined with a pre-connected switch 15, by way of which an electronic control and monitoring unit 16 and an ignition device 17 are set into

operation when the thermostat 14 is switched on.

The gas cock 2 and the thermostat 14 with the switch 15 are mounted on a rigid bracket 18, wherein the axial spacing depends on the diameters of the gear wheels 13 and 14, as is explained later.

By means of a control grip 22 mounted together with the gear wheel 12 on a rotary and axially displaceable shaft 21 of the gas cock 2, the burner 6 or the burner 7 are, according to the rotational direction of the shaft, placed in operation. On rotation of the shaft for placing the burner 6 in operation, the gear wheel 13 mounted on a shaft 23 of the thermostat 14 is simultaneously actuated in order to switch on the thermostat 14.

The following functions are initiated by this operation: Through turning and pressing the control grip 22, the gas feed 1 at the gas cock 2 is opened mechanically and the holding plate in the insert 8 of the thermo-electric protection system is laid against the magnet 9. At the same time, the thermostat 14 and the switch 15 are activated by the rotational movement, whereby voltage is fed by way of the unit 16 to the valve 5 and the ignition device 17, the gas feed to the burner 6 is opened and the gas flowing out of the burner is ignited by an ignition element 24. Detection of the flame ionisation causes the monitoring system to be held in operation.

At the same time, voltage is fed from the unit 16 by way of a feed 26 to the insert 8, so that the electromagnet 9 promptly holds the holding plate fast and the gas feed 1 thus remains open immediately after release of the control grip 22.

As long as the flame continues to burn, an ionisation detector 25 protects the burner 6 in known manner, i.e. on extinction of the

flame, the valve 5 is then closed.

The valve 5 is also closed when a sensor 27 of the thermostat 14 senses a set temperature and interrupts the current circuit to the valve 5. This operation is part of the temperature control of the thermostat.

The thermo-electric safety circuit, which is associated with the insert 8 and which acts in parallel with the safety circuit of the ionisation detector 25 through heating of at least one of the thermal elements 10 and 11 for production of a magnet current, is - as already explained - bridged over by the external current feed 26 so that the gas flow to the valve 5 is always provided and, after opening of the valve 5 initiated by the temperature demand of the thermostat 14, can flow to the burner. In this case, too, ignition and protection or monitoring repeat by way of the above-described ignition and ionisation detection devices.

The operative state of the baking oven can be indicated by way of an indicator lamp 28.

In order to prevent the burner 6 from extinguishing due to current failure causing closure of the valve 5 and then being unable to be restored to operation, the valve 5 is equipped with a manual emergency actuation means in that an actuating shaft 30 thereof is provided with a slot and can be turned by a tool, for example a screwdriver or coin, and the valve 5 opened to allow gas to flow to the burner 6. Protection of the now current-free system is now taken over solely by the thermal element 10, which supplies the current for the magnet 9 of the insert 8 and thereby keeps the cock 2 open for operation of the burner 6. In this manner, the burner 6 is capable of function even without mains

current and is secured against unintentional gas outflow.

Regulation of the oven temperature is now effected solely through appropriate rotation of the control grip 22 and thereby of the cock 2.

On restoration of the current supply, the manual emergency actuation means must be reset into the initial position.

In order to further secure the burner against the outflow of unburnt gas, a limit switch 32 is mounted at the shaft 30 and, through actuation by a cam on the shaft 30, interrupts current feed to the components 16 and 17. In this way it is ensured that no external current reaches the magnet 9 when the valve 5 is opened manually and protection is exclusively by way of the thermal element 10.

The control of two different systems by a single control grip 22 is achieved with, for example, the construction of the gear wheels 12 and 13 shown in Fig. 2. The pitch circle diameters of the gear wheels 12 and 13 are so selected that the different rotational angle ranges of the gas cock 2 and of the thermostat 14, which are required for the actuation, are synchronised. This means that, for example, the gas cock 2 is actuated by the control grip 22 on rotation to the left through an angular range of 210° and the thermostat 14 is actuated by the control grip 22 in rightward rotation through an angular range of up to 270°.

The thickness of the gear wheels 12 and 13 is, as can be seen particularly in Fig. 1, such that, on actuation of the control grip 22, the axial displacement for achieving valve element displacement in the gas cock 2 is taken into consideration and the two gear wheels remain in engagement, i.e. the gear wheel 13 of the thermostat 14 is constructed to be thicker.

Since the thermostat 14 is not also set into operation when the grill burner 7 is placed in operation, the gear wheel 12 has no teeth over the corresponding sector 33 for the opening of the outlet 4 to the grill burner 7. Consequently, there is no action on the gear wheel 13 on rightward rotation of the control grip 22 for the grilling process. The ignition of gas at the grill burner 7 in that case takes place by way of a switch 35 which, when the control grip 22 is pressed in and in the appropriate rotary setting of the gear wheel 12, feeds voltage to an ignition element 36 of the grill burner 7.

In order to permit access to a fine-setting jet 37 in the gas cock 2, for adjustment to other kinds of gas or for initial regulation, the gear wheel 12 has a recess 38 through which the jet 37 can be reached without disassembly of the gear wheel 12.

A particular advantage of the regulating and control equipment in an oven embodying the invention resides in the use and association of control parts in such a manner that the control of two systems, which are independent in terms of safety technique, is possible by one control grip and in the retention of controllability in the case of current failure but without loss of protection or monitoring of the burner.

CLAIMS

1. A gas oven comprising a baking oven burner, a grill burner, a manually operable gas cock with two outlets each connected by a respective duct to a respective one of the burners, electromagnetic holding means actuable to hold the gas cock in an open state, electromagnetic valve means arranged in the duct to the baking oven burner, ignition means for ignition of gas in the oven, a control and monitoring unit for controlling each of the electromagnetic holding means, the electromagnetic valve means and the ignition means, an electric thermostat mechanically coupled to the gas cock and operable to drive the control and monitoring unit, a respective thermal element associated with each of the burners and arranged to provide actuating current for the electromagnetic holding means, and manually operable means operable to permit supply of gas from the gas cock to the baking oven burner for emergency operation thereof in the case of failure of actuating current supply to the electromagnetic valve means.

2. A gas oven as claimed in claim 1, wherein the electric thermostat is mechanically coupled to the gas cock by way of two interengageable gear wheels respectively mounted on a rotary actuating shaft of the gas cock and a rotary actuating shaft of the thermostat, the shaft of the gas cock additionally being axially displaceable.

3. A gas oven as claimed in claim 2, wherein the shafts are movable through respectively different angular ranges for actuation of the gas cock and the thermostat, the pitch circle diameters of the gear wheels being so selected that rotation of the shaft of the gas cock through the respective angular range causes rotation of the shaft of the thermostat through its respective angular range.

4. A gas oven as claimed in either claim 2 or claim 3, wherein the shaft of the gas cock is movable through a first sector to open the outlet for the duct to the gas oven burner and a second sector, different from the first sector, to open the outlet for the duct to the grill burner, the gear wheel on the gas cock shaft being provided with an untoothed portion over the second sector.

5. A gas oven as claimed in any one of the preceding claims, comprising a temperature sensor and an ionisation detector each arranged to provide additional control of the electromagnetic valve means in parallel with the control and monitoring unit.

6. A gas oven as claimed in any one of the preceding claims, comprising means to bridge over the thermal element associated with the baking oven burner and to supply actuating current to the electromagnetic holding means.

7. A gas oven as claimed in any one of the preceding claims, said manually operable means comprising an actuating shaft for manual actuation of the electromagnetic valve means, and the oven further comprising a limit switch operable by that shaft to isolate the control and monitoring unit from a current supply terminal therefor.

8. A gas oven as claimed in any one of claims 1 to 6, said manually operable means comprising a manually openable bypass valve connected between the gas cock and the baking oven burner in parallel with the electromagnetic valve means.

9. A gas oven substantially as hereinbefore described with reference to the accompanying drawings.

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